



A. Course Information	
Final award title(s)	Digital and Technology Solutions Professional (Network Engineer) Course Code(s) 5201
Intermediate award title(s)	
Awarding Institution	London South Bank University
School	<input type="checkbox"/> ASC <input type="checkbox"/> ACI <input type="checkbox"/> BEA <input type="checkbox"/> BUS <input checked="" type="checkbox"/> ENG <input type="checkbox"/> HSC <input type="checkbox"/> LSS
Division	
Delivery site(s) for course(s)	<input checked="" type="checkbox"/> Southwark <input type="checkbox"/> Havering <input type="checkbox"/> Other: please specify
Mode(s) of delivery	<input type="checkbox"/> Full time <input checked="" type="checkbox"/> Part time ¹ <input type="checkbox"/> Both
Length of course	Part time: 4..years ¹
Approval dates:	Course(s) validated August 2017
	Course Review date August 2022
	Course specification last updated and signed off September 2022
Professional, Statutory & Regulatory Body accreditation	Skills Funding Agency
Link to Institute of Apprenticeship (IoA) Standard and Assessment Plan (Apprenticeship only)	Standard: https://www.instituteforapprenticeships.org/apprenticeship-standards/digital-and-technology-solutions-professional-integrated-degree-v1-1 Assessment Plan: https://www.instituteforapprenticeships.org/media/1073/digital_and_technology_solutions_professional.pdf
Reference points:	Internal LSBU Mission Statement and Strategic Plan; LSBU Core Skills Policy; LSBU Academic Regulations; School of Engineering Strategic Plan
	External Digital and Technology Solutions Professional Standard; QAA Subject Benchmark Statement for Engineering, Engineering Council, The UK Standard for Professional Engineering; Competence 3rd Edition (UKSPEC3); Framework for Higher Education Qualifications; LSBU

¹ Best fit for the apprenticeship degree, 1 day per week at university, blended learning and 4 days at employers.

		Academic Regulations; In accordance with the University's Academic Regulations, the awards are aligned with the Framework for Higher Education Qualifications (FHEQ), thereby setting the expected level of achievement in the course.
B. Course Aims, Features and Outcomes		
Distinctive features of course	<p>The Digital Technologies and Solutions Professional degree offers the opportunity to develop the knowledge, skills and behaviours necessary for a successful and productive career in the IT industry.</p> <p>The emphasis is on developing a comprehensive understanding of sophisticated digital technologies and applying knowledge and skills gained studying to real world projects in the work place – work based learning (WBL). The course is an integration of a validated existing BSc IT degree with on-the-job activity.</p> <p>The connectivity between the two dimensions of the course is achieved through the mapping of the IT degree modules to the Digital Professional Apprenticeship standard and work based learning projects. Finally an end point assessment is used to evaluate competencies and assess if the apprentice has met the standard.</p> <p>Employers can work with the university to choose an appropriate work based project and a final synoptic project that empowers the apprentice to new highly productive levels of competency.</p>	
Course Aims	<p>The BSc (Hons) Digital Technologies and Solutions Professional degree aims to:</p> <ol style="list-style-type: none"> 1. produce apprentices who are equipped with the core knowledge and skills to design, develop, use and manage computer systems of diverse kinds. 2. facilitate an environment where the study of the analysis, design, implementation and evaluation of computer systems can be transferred to the workplace and practical ends that benefit both the employer and apprentice learner 3. provide a combination of theory, practical skills, knowledge and behaviours suitable for the professional role – not job title - of the computing industry apprentice 4. produce apprentices with the professional and ethical standards required for employment in the industry 	
Course Outcomes	<p>A. Apprentices will acquire knowledge and understanding of:</p> <ol style="list-style-type: none"> 1. the foundations and contemporary development of theoretical computer science, computer hardware, computer networks, operating systems and application software 2. requirements analysis and the formal specification of computer systems 3. software development using a variety of software engineering techniques, design notations, development environments and programming languages 4. data encoding, storage, management and analysis 5. the fundamental issues related to robustness and security in systems, software and networks 6. social, ethical and legal issues which affect the development and use of information systems 	

Teaching and learning strategy:

There will be a combination of lectures, tutorials and computer laboratory activities to inform, discuss and enable apprentices to assimilate the material.

The delivery will aim to ensure a balance of cognitive tasks involving the demonstration and application of factual knowledge with practical exercises in computer laboratories to reinforce learning through direct experience.

At level 4 independent (non-contact) study hours will be predominantly concerned with assimilation, at level 5 knowledge acquisition will take place as part of analytical study and at level 6 apprentices will be engaging in independent research.

Assessment:

For all modules summative assessment consists of either 100% coursework or a combination of coursework and two-hour closed-book examination.

Apprentices' acquisition of knowledge and understanding will be assessed by coursework tasks requiring the demonstration of such, including assessed practical tasks, report writing, in-class tests and presentations. Wherever possible formative assessment will be used to allow apprentices to gauge their own progress and address weak areas. Examinations will be closed-book and will require apprentices to demonstrate that knowledge and understanding have been achieved.

B. Apprentices will develop their intellectual skills such that they are able to:

1. locate, analyse, evaluate and make effective use of reference material including literature from academic, technical and professional sources
2. comprehend and critically evaluate theoretical arguments in computer science
3. analyse and predict future developments in computing based upon fundamental principles and evolving trends
4. evaluate, modify and synthesise approaches to software development and systems design
5. collaborate effectively and professionally with technical and non-technical colleagues
6. analyse practical problems and propose appropriate and feasible technical solutions

Teaching and learning strategy:

There will be a combination of lectures, tutorials and computer laboratory activities to analyse, explore and critically evaluate the material in order to develop apprentices' intellectual abilities around it.

The delivery will aim to ensure a balance of cognitive tasks involving problem-solving, analysis and critique with practical exercises in computer laboratories to reinforce learning through direct experience.

At level 5 independent (non-contact) study hours will be predominantly concerned with analysis of material, while by level 6 apprentices will be engaging in critical evaluation.

Assessment:

For all modules summative assessment consists of either 100% coursework or a combination of coursework and two-hour closed-book examination.

Apprentices' intellectual skills will be assessed by coursework tasks requiring the demonstration of such, including assessed practical tasks, analytical and evaluative report writing, and problem-solving in in-class tests. Wherever possible formative assessment will be used to allow apprentices to gauge their own progress, understand what is expected of them and address weak areas. Examinations will require apprentices to demonstrate problem-solving, analysis and critical evaluation.

C. Apprentices will acquire and develop practical skills such that they are able to:

1. design, develop, test and document software representative of contemporary programming practices and using professional development tools and techniques
2. analyse and specify requirements for the implementation of a range of computing and information systems
3. effectively use formal notations and graphical and numerical representations for data, processes and other relevant concepts
4. analyse systems for potential security weaknesses and propose mitigating measures that could be taken
5. comprehend the fundamental principles underpinning computer systems and use them to estimate limitations they impose and potential future advancements they might allow
6. acquire new technical competencies and skills by applying theoretical principles to future developments in technology

Teaching and learning strategy:

There will be a combination of lectures, tutorials and computer laboratory activities to contextualise course material within practical applications and utilising real-world examples wherever possible.

The delivery will aim to ensure a balance of cognitive tasks concerning the practical applications, limitations and possibilities of the material covered with practical exercises in computer laboratories to demonstrate these concepts and allow apprentices to develop practical skills.

At level 6 apprentices will undertake an independently managed project which will involve making use of practical (and other) skills acquired during the course. Apprentices taking the sandwich course will acquire practical skills and experience in their internship.

	<p>Assessment:</p> <p>For all modules summative assessment consists of either 100% coursework or a combination of coursework and two-hour closed-book examination.</p> <p>Apprentices' practical skills will be assessed by coursework tasks requiring the demonstration of such, including assessed practical tasks, the identification of practical techniques described in reports, and the successful application of skills in the development of their final year project. Wherever possible, but particularly during laboratory activities, formative assessment will be used to allow apprentices to gauge their own progress and identify areas requiring more practice. Examinations will require apprentices to demonstrate familiarity with and capability of practical skills.</p> <p>D. Apprentices will acquire and develop transferable skills such that they are able to:</p> <ol style="list-style-type: none"> 1. communicate effectively verbally and in writing 2. work effectively in teams 3. manage time and personal resources effectively 4. sustain self-directed learning to maintain continuing professional development <p>Teaching and learning strategy:</p> <p>Modules exist to support the development of study and communication skills, to develop effective team-working and to develop self-management skills. In addition, classroom activities in many other modules will be used to foster these abilities.</p> <p>Assessment:</p> <p>Modes of assessment used to gauge and develop transferable skills include essays and research reports, project records and documentation, presentations, posters, log books, websites, blogs, assessed group work and interactions on collaborative websites and social media. Formative assessment of transferable skills will be incorporated into all modules for which it is practical, and selected modules will include summative assessment as well.</p>
C. Entry Requirements	
Pre-requisites for this course	<p>In order to be considered for entry to the course(s) applicants will be required to have the following qualifications:</p> <p>112 UCAS points:</p> <ul style="list-style-type: none"> • A Level BCC or; • BTEC National Diploma DMM or; • Access to HE qualifications with 9 Distinctions and 36 Merits or; • Equivalent level 3 qualifications worth 112 UCAS points

- Applicants must hold 5 GCSEs A-C including Maths and English or equivalent (reformed GCSEs grade 4 or above).

Students will be registered on a recognised apprenticeship contract with an employer.

We welcome qualifications from around the world. English language qualifications for international apprenticeships: IELTS score of 6.0, TOFEL-550 (print-based), TOFEL-80 (internet-based), Cambridge Proficiency or Advanced Grade C.

(See http://www.lsbu.ac.uk/__data/assets/pdf_file/0019/9280/english-language-qualifications-general.pdf for full details of LSBU's English language requirements)

Co-requisites for this course

Qualifications required for this course

See above.

D. Additional Information

Course structure(s)

The course has six pathways with prescribed specialism modules. There are no optional modules other than through pathway choice. This was in line with market research which indicated employers were not keen on optionality at a level such as module delivery.

Table 1 shows the program delivery by module.

Level	BSc (Hons) Digital and Technology Solutions Professional					
4	Professional Practice	Fundamentals of Software Development	Requirements Analysis and UCD	Discrete Mathematics	Software Development	Fundamentals of Computer Science
5	Big Data and Database Systems	Analysis and Design	Principles of Data Networks	Professional Review and Future Planning	Web Technologies	System Administration and Maintenance
6	ICT Project Management in Practice	Mobile Computing	Systems and Cybersecurity	Synoptic Project & e-Portfolio		

All Modules are 20 credits each except the e-Portfolio and Synoptic project which are 30 credits each.

 Work Based Learning related

Table 1 Apprenticeship Programme

The next section shows the four year plan of modules for the IT Analyst pathway.

Network Engineer

In the year one and three there are 100 credits per year over one or one and a half days (a blended approach for the latter) depending on timetabling constraints. In the years two and four there are 80 credits per year timetabled over one day.

Year 1 (100 credits)

<i>Semester 1</i>	<i>Semester 2</i>
Discrete Mathematics	Professional Practice
Fundamentals of Software Development	Requirements Analysis and UCD
	Software Development
Gateway Preparation (0 Credit)	

Year 2 (100 credits)

<i>Semester 1</i>	<i>Semester 2</i>
Fundamentals of Computer Science	Professional Review and Future Planning
Web Technologies	Big Data and Database Systems
Analysis and Design	
Gateway Preparation (0 Credit)	

Year 3 (80 credits)

<i>Semester 1</i>	<i>Semester 2</i>
Mobile Computing	System Administration and Maintenance
Principles of Data Network	Systems and Cyber Security
Gateway Preparation (0 Credit)	

Year 4 (80 credits)

<i>Semester 1</i>	<i>Semester 2</i>
ICT Project Management in Practice	
Synoptic Project and e-Portfolio	

The modules are delivered as part of the BSc (Hons) Information Technology framework except for the Professional Review and Future Planning module and the synoptic project module. These two are specific to the apprenticeship degree.

Gateway Preparation Module

The Gateway is the entry point to End-Point Assessment (EPA). It is the point at which the apprentice has completed their learning, met the requirements of the standard, off-the-job (OJT) training (6 hours per week), and that they, alongside their employer and LSBU agree that they are ready to enter their EPA.

The Gateway Preparation module is a pass / fail, zero credit module designed to support apprentices to identify and work towards meeting the Gateway criteria from an early stage in their apprenticeship, particularly those that sit outside of an academic qualification. The module will be completed each year throughout the duration of the apprenticeship up to

passing the Gateway. A minimum record of 8% of OJT, contributing towards the final total of 6 hours per week is required to pass the module in each year.

IMPORTANT: Evidence of meeting the ALL knowledge, skills and behaviour detailed in the IfATE Standard Assessment Plan, must be covered in the e-portfolio prior to the final Gateway review i.e. apprentices must address each KSB on their respective apprenticeship standard with appropriate workplace evidence.

E. Course Modules

Module Code	Module Title	Level	Semester	Credit value
CSI-4-PPR	Professional Practice	4	2	20
CSI-4-DMA	Discrete Mathematics	4	1	20
CSI-4-FCS	Fundamentals of Computer Science	4	1	20
CSI -4-RAU	Requirements Analysis and UCD	4	2	20
CSI -4-FSD	Fundamentals of Software Development	4	1	20
CSI -4-SOD	Software Development	4	2	20
CSI -5-BDD	Big data and Database Systems	5	2	20
CSI -5-PDN	Principles of Data Networks	5	1	20
CSI -5-AAD	Analysis and Design	5	1	20
CSI-5-PRF	Professional Review and Future Planning	5	2	20
CSI_5_ISA	System Administration and Maintenance	5	2	20
CSI_5_WE T	Web Technologies	5	1	20
CSI_6_ICT	ICT Project Management in Practice	6	2	20
CSI_6_MO C	Mobile Computing	6	1	20
CSI -6-SCS	Systems and Cyber Security	6	1	20
CSI-6-SPE	Synoptic Project and e-Portfolio	6	1, 2	60
CSI_4_GW 1	Gateway Preparation	4	B	0
CSI_5_GW 2	Gateway Preparation	5	B	0
CSI_6_GW 3	Gateway Preparation	6	B	0

List of Appendices

List of Appendices

- Appendix A: Digital Technologies and Solutions apprenticeship standard
- Appendix B: Curriculum Map
- Appendix C: Personal Development Planning
- Appendix D: Mappings of outcomes from the Digital Technologies and Solutions Professional Apprenticeship standard to modules

Appendix B: Curriculum Maps (BSc IT modules)

The numbered column headings under each category refer to the numbered learning outcomes in that category as they appear in the specification.

	Module\Outcome	cr	Knowledge						Intellectual						Practical						Transferable			
			1	2	3	4	5	IT	1	2	3	4	5	IT	1	2	3	4	5	IT	1	2	3	4
L4	Professional Practice	20	t	ta	ta	ta	t		ta	ta	t	t	t							ta	ta	ta	t	
L4	Discrete Mathematics	20	ta	ta		ta	ta		ta	t	t				ta		t		ta		ta			
L4	Fundamentals of Computer Science	20	ta	ta	ta		ta		ta	ta					ta		ta							
L4	Requirements Analysis and UCD	20	ta	ta	ta	t	ta		ta	t		t	ta		ta		ta		ta	ta	ta			
L4	Fundamentals of Software Development	20	t	ta	ta	t				ta					ta	ta	ta				ta			
L4	Software Development	20	ta	ta	t	t				ta		ta			ta	ta	ta			ta	ta			
L5	Big data and Database Systems	20			tda	tda	tda	tda		tda		tda	ta		tda		ta	ta	ta	tda	da	da		
L5	Principles of data Networks	20		tda	da	da	tda	ta	da			tda		ta	da		tda	ta	tda	da	da	da		
L5	Analysis and Design	20	tda	tda	t	t	tda		tda	tda		ta	ta		tda		ta	ta	tda	da	d			
L5	Web Technologies	20			td	tda	da		da	da			tda			tda		d		da	da	tda		
L5	System Administration and Maintenance	20			td	tda	da		da	da			tda			tda		d		da	da	tda		
L5	Professional Review & Future Planning	20	tda	tda	tda	tda	tda	tda	d	da	tda	tda	tda	tda	tda	tda		tda	tda	da	d	d	d	tda
L6	Mobile Computing	20	tda	d	d	tda	tda	d	tda	d	tda		tda	tda	tda	tda	tda	tda	tda	tda	d	d		
L6	ICT Project Management in Practice	20		tda	tda	tda		tda		tda	tda		tda	tda				ta	tda	tda	tda	da	da	tda
L6	Systems and Cyber Security	20		tda	tda	tda	tda		tda	tda	tda	tda	tda					tda		tda	da	da	da	tda
L6	Synoptic Project and e-Portfolio	60	d	Da	d	d			d			d		tda	td	td	td			td	d		d	

Key: t = taught d = developed a = assessed

Apprenticeship modules are not mapped to the curriculum here.

Appendix C: Personal Development Planning

Personal Development Planning

A variety of terms are used in higher education to describe a process undertaken by individuals to gather evidence on, record and review their own learning and achievement, and identify ways in which they might improve themselves academically and more broadly. The term Personal Development Planning (PDP) is proposed to describe a structured process undertaken by an individual to reflect upon their own learning, performance and/or achievement and to plan for their personal educational and career development. The following table shows where PDP is being used within the framework.

Approach to PDP	Level 4	Level 5	Level 6
1 Supporting the development and recognition of skills through the personal tutor system.	One Level 4 module tutors also acts as personal tutor	Personal tutors continue to support apprentice's planning and development of records of achievement	Pathway/project supervisor take over personal tutoring role.
2 Supporting the development and recognition of skills in academic modules.	All modules plus Integrative Assignment, WBL	All modules	
3 Supporting the development and recognition of skills through purpose designed modules/units.	Business & Professional Issues	Professional Review and Future Planning	IS Project Management
4 Supporting the development and recognition of skills through research projects.	WBL	Professional Review and Future Planning, WBL	Synoptic Project and WBL
5 Supporting the development and recognition of career management skills.	Business & Professional Issues, WBL	WBL	IS Project Management, WBL
6 Supporting the development and recognition of career management skills through work experience.	WBL	WBL	WBL
7 Supporting the development of skills by recognising that they can be developed through extra curricula activities.	extra-curricula and capstone events	extra-curricula and capstone events	extra-curricula and capstone events
8 Supporting the development of the skills and attitudes as a basis for continuing professional development.	Business & Professional Issues	Professional Review and Future Planning	IS Project Management
9 Other approaches to personal development planning.	e-Portfolio	e-Portfolio, Professional Review and Future Planning	e-Portfolio

Approach to PDP	Level 4	Level 5	Level 6
10 The means by which self-reflection, evaluation and planned development is supported e.g electronic or paper-based learning log or diary.	e-Portfolio	e-Portfolio, Professional Review and Future Planning	e-Portfolio

Apprentices will be allocated a personal tutor for both campus related experience and on the job liaison support.

Appendix D: Digital & Technology Solutions Professional Module Mappings to DTSP Standard KSBs - Network Engineer Pathway

See Section E for the full module codes and titles

			Level 4 Modules					
			DM	FCS	FSD	SOD	RAU	PPR
Index	Knowledge, Skills, and Behaviours (as per Apprenticeship Standard)							
	CORE KNOWLEDGE	All Pathways						
1	Business	How business exploits technology solutions for competitive advantage				X	X	X
2		How strategic decisions are made concerning acquiring technology solutions resources and capabilities including the ability to evaluate the different sourcing options						X
3	Technology	The value of technology investments and how to formulate a business case for a new technology solution, including estimation of both costs and benefits.						X
4		Contemporary techniques for design, developing, testing, correcting, deploying and documenting software systems from specifications, using agreed standards and tools.		X	X	X	X	

5		The role of data management systems in managing organisational data and information			X	X		
6	<i>Computer Networks</i>	The common vulnerabilities in computer networks and systems including un-secure coding and unprotected networks			X		X	
7	Team Working	How teams work effectively to produce technology solutions.						X
8		The various roles, functions and activities related to technology solutions within an organisation.						X
9	Project Management	How to deliver a technology solutions project accurately consistent with business needs.					X	X
10		The issues of quality, cost and time for projects, including contractual obligations and resource constraints.					X	
	CORE SKILLS							
11	Information Systems	Is able to critically analyse a business domain in order to identify the role of information systems, highlight issues and identify opportunities for improvement through evaluating information systems in relation to their intended purpose and effectiveness.					X	X
12	System Development	Analyses business and technical requirements to select and specify appropriate technology solutions.					X	X

13		Designs, implements, tests, and debugs software to meet requirements using contemporary methods including agile development.		X	X	X	X	
14		Manages the development and assurance of software artefacts applying secure development practises to ensure system resilience.					X	
15		Configures and deploys solutions to end users.				X		
16	Data	Identifies organisational information requirements and can model data solutions using conceptual data modelling techniques.	X				X	
17		Is able to implement a database solution using an industry standard database management system (DBMS).				X		
18		Can perform database administration tasks and is cognisant of the key concepts of data quality and data security.						
19		Is able to manage data effectively and undertake data analysis.	X			X		
20	Cyber Security	Is able to undertake a security risk assessment for a simple system and propose remediation advice.						
21		Can identify, analyse and evaluate security threats and hazards to planned and installed information systems or services (e.g. Cloud services).						

22	Business Organisation	Can apply organisational theory, change management, marketing, strategic practice, human resource management and IT service management to technology solutions development.						
23		Develops well-reasoned investment						
24	IT Project Management	Follows a systematic methodology for initiating, planning, executing, controlling, and closing projects.						
25		Applies industry standard processes, methods, techniques and tools to manage technology solutions projects.						
26		Is able to manage a project (typically less than six months, no inter-dependency with other projects and no strategic impact) including identifying and resolving deviations and the management of problems and escalation processes.				X		
27	Computer and Network Infrastructure:	Can plan, design and manage computer networks with an overall focus on the services and capabilities that network infrastructure solutions enable in an organisational context.		X				
28		Identifies network security risks and their remediation.		X				
	BEHAVIOURS							

29	Professional, interpersonal and business skills	1. Fluent in written communications, able to articulate complex issues.	X				X	X
30		2. Makes concise, engaging and well-structured verbal presentations, arguments and explanations.		X	X	X		X
31		3. Able to deal with different, competing interests within and outside the organisation with excellent negotiation skills.			X	X		X
32		4. Able to identify the preferences, motivations, strengths and limitations of other people and apply these insights to work more effectively with and to motivate others.					X	X
33		5. Competent in active listening and in leading, influencing and persuading others constructively.					X	X
34		6. Able to give and receive feedback constructively and incorporate it into their own development and life-long learning.				X	X	X
35		7. Applies analytical and critical thinking skills to Technology Solutions development and to systematically analyse and apply structured problem solving techniques to complex systems and situations.	X	X	X	X		

36		8. Able to put forward, demonstrate value and gain commitment to a moderately complex technology-oriented solution, demonstrating understanding of business need, using open questions and summarising skills and basic negotiating skills.							X
37		9. Able to conduct effective research, using literature and other media, into IT and business related topics.						X	X
38	Attributes and behaviours	Have demonstrated that they have mastered basic business disciplines, ethics and courtesies, demonstrating timeliness and focus when faced with distractions and the ability to complete tasks to a deadline with high quality.	X	X	X	X	X	X	X
39		Flexible attitude							X
40		A thorough approach to work	X	X	X	X	X	X	X
41		Logical thinking and creative approach to problem solving	X	X	X	X	X	X	X
42		Ability to perform under pressure	X	X	X	X	X	X	X
	SPECIALIST KNOWLEDGE	- Network Engineer							
43		The fundamental building blocks (e.g. routers, switches, hubs, storage, transmission) and typical architectures (e.g. server/client, hub/spoke) of computers, networks and the Internet.		X					

44		The main features of routing and Internet network protocols in use, their purpose and relationship to each other, including the physical and data link layer (e.g. https, HTTP, SMTP, SNMP, TCP, IP, etc.).							
45		The main factors that affect network performance (e.g. the relationship between bandwidth, number of users, nature of traffic, contention).							
46		Failure modes in protocols (e.g. why a protocol may 'hang' and the effect of data communication errors).							
47		The ways to improve performance (e.g. application of traffic shaping, changes to architecture to avoid bottlenecks, network policy that prohibit streaming protocols).							
48		The issues that may arise in the day to day operation of networks and how to resolve them.							
	SPECIALIST SKILLS	- Network Engineer							
49		Plan, design, build and test a simple network to a requirement specification that includes hubs, switches, routers and wireless user devices, applying appropriate security products and processes.							
50		Identify the key characteristics of a new network service and develop estimates of the expected traffic intensity and traffic load that the network must support.							

51		Determine the minimum network capacity of planned networks to meet network requirements.						
52		Design, build, test, configure and optimise a distributed network (more than 1 sub- net), including switches, routers and firewalls to meet given requirements.						
53		Analyse network performance and troubleshoot typical problems in networks.						
54		Identify and evaluate network security risks and incorporate appropriate security products and processes into network designs to increase security, resilience and dependability.						

			Level 5 Modules						
			WET	BDD	PRF	ISA	APD	AAD	ISM
Index	Knowledge, Skills, and Behaviours (as per Apprenticeship Standard)								
	CORE KNOWLEDGE	All Pathways							
1	Business	How business exploits technology solutions for competitive advantage							X
2		How strategic decisions are made concerning acquiring technology solutions resources and capabilities including the ability to evaluate the different sourcing options			X	X			X
3	Technology	The value of technology investments and how to formulate a business case for a new technology solution, including estimation of both costs and benefits.				X			X
4		Contemporary techniques for design, developing, testing, correcting, deploying and documenting software systems from specifications, using agreed standards and tools.	X	X				X	
5		The role of data management systems in managing organisational data and information		X					X
6	<i>Computer Networks</i>	The common vulnerabilities in computer networks and systems including un-secure coding and unprotected networks	X	X		X			
7	Team Working	How teams work effectively to produce technology solutions.			X	X			

8		The various roles, functions and activities related to technology solutions within an organisation.			X	X			X
9	Project Management	How to deliver a technology solutions project accurately consistent with business needs.			X	X			X
10		The issues of quality, cost and time for projects, including contractual obligations and resource constraints.				X			X
CORE SKILLS									
11	Information Systems	Is able to critically analyse a business domain in order to identify the role of information systems, highlight issues and identify opportunities for improvement through evaluating information systems in relation to their intended purpose and effectiveness.				X			X
12	System Development	Analyses business and technical requirements to select and specify appropriate technology solutions.	X	X		X			X
13		Designs, implements, tests, and debugs software to meet requirements using contemporary methods including agile development.	X	X				X	
14		Manages the development and assurance of software artefacts applying secure development practises to ensure system resilience.				X		X	
15		Configures and deploys solutions to end users.	X	X		X			

16	Data	Identifies organisational information requirements and can model data solutions using conceptual data modelling techniques.	X	X				X	
17		Is able to implement a database solution using an industry standard database management system (DBMS).	X	X					
18		Can perform database administration tasks and is cognisant of the key concepts of data quality and data security.		X		X			
19		Is able to manage data effectively and undertake data analysis.		X					
20	Cyber Security	Is able to undertake a security risk assessment for a simple system and propose remediation advice.		X		X			
21		Can identify, analyse and evaluate security threats and hazards to planned and installed information systems or services (e.g. Cloud services).				X			X
22	Business Organisation	Can apply organisational theory, change management, marketing, strategic practice, human resource management and IT service management to technology solutions development.				X			X
23		Develops well-reasoned investment				X			
24	IT Project Management	Follows a systematic methodology for initiating, planning, executing, controlling, and closing projects.			X				X

25		Applies industry standard processes, methods, techniques and tools to manage technology solutions projects.				X			X
26		Is able to manage a project (typically less than six months, no inter-dependency with other projects and no strategic impact) including identifying and resolving deviations and the management of problems and escalation processes.	X	X				X	
27	Computer and Network Infrastructure:	Can plan, design and manage computer networks with an overall focus on the services and capabilities that network infrastructure solutions enable in an organisational context.				X			X
28		Identifies network security risks and their remediation.	X			X			X
	BEHAVIOURS								
29	Professional, interpersonal and business skills	1. Fluent in written communications, able to articulate complex issues.	X	X	X	X		X	X
30		2. Makes concise, engaging and well-structured verbal presentations, arguments and explanations.	X		X				
31		3. Able to deal with different, competing interests within and outside the organisation with excellent negotiation skills.			X				

32		4. Able to identify the preferences, motivations, strengths and limitations of other people and apply these insights to work more effectively with and to motivate others.							
33		5. Competent in active listening and in leading, influencing and persuading others constructively.			X				
34		6. Able to give and receive feedback constructively and incorporate it into their own development and life-long learning.	X		X				
35		7. Applies analytical and critical thinking skills to Technology Solutions development and to systematically analyse and apply structured problem solving techniques to complex systems and situations.	X	X		X			X
36		8. Able to put forward, demonstrate value and gain commitment to a moderately complex technology-oriented solution, demonstrating understanding of business need, using open questions and summarising skills and basic negotiating skills.			X	X			
37		9. Able to conduct effective research, using literature and other media, into IT and business related topics.			X	X	X		X
38	Attributes and behaviours	Have demonstrated that they have mastered basic business disciplines, ethics and courtesies, demonstrating timeliness and focus when faced with distractions and the ability to complete tasks to a deadline with high quality.			X				

39		Flexible attitude			X				
40		A thorough approach to work	X	X	X	X		X	X
41		Logical thinking and creative approach to problem solving	X	X	X	X		X	
42		Ability to perform under pressure	X	X	X	X		X	X
	SPECIALIST KNOWLEDGE	- Network Engineer							
43		The fundamental building blocks (e.g. routers, switches, hubs, storage, transmission) and typical architectures (e.g. server/client, hub/spoke) of computers, networks and the Internet.			X	X			
44		The main features of routing and Internet network protocols in use, their purpose and relationship to each other, including the physical and data link layer (e.g. https, HTTP, SMTP, SNMP, TCP, IP, etc.).			X	X			X
45		The main factors that affect network performance (e.g. the relationship between bandwidth, number of users, nature of traffic, contention).				X			
46		Failure modes in protocols (e.g. why a protocol may 'hang' and the effect of data communication errors).				X			
47		The ways to improve performance (e.g. application of traffic shaping, changes to architecture to avoid bottlenecks, network policy that prohibit streaming protocols).				X			X

48		The issues that may arise in the day to day operation of networks and how to resolve them.			X	X			X
	SPECIALIST SKILLS	- Network Engineer							
49		Plan, design, build and test a simple network to a requirement specification that includes hubs, switches, routers and wireless user devices, applying appropriate security products and processes.			X	X			
50		Identify the key characteristics of a new network service and develop estimates of the expected traffic intensity and traffic load that the network must support.				X			
51		Determine the minimum network capacity of planned networks to meet network requirements.				X			
52		Design, build, test, configure and optimise a distributed network (more than 1 sub- net), including switches, routers and firewalls to meet given requirements.				X			
53		Analyse network performance and troubleshoot typical problems in networks.				X			
54		Identify and evaluate network security risks and incorporate appropriate security products and processes into network designs to increase security, resilience and dependability.				X			

			Level 6 Modules							
			ICT	DCM	ARI	SIT	422	MAD	PDM	SCS
Index	Knowledge, Skills, and Behaviours (as per Apprenticeship Standard)									
	CORE KNOWLEDGE	All Pathways								
1	Business	How business exploits technology solutions for competitive advantage	X				X			
2		How strategic decisions are made concerning acquiring technology solutions resources and capabilities including the ability to evaluate the different sourcing options	X				X			
3	Technology	The value of technology investments and how to formulate a business case for a new technology solution, including estimation of both costs and benefits.	X				X			
4		Contemporary techniques for design, developing, testing, correcting, deploying and documenting software systems from specifications, using agreed standards and tools.		X	X	X			X	
5		The role of data management systems in managing organisational data and information		X						X
6	<i>Computer Networks</i>	The common vulnerabilities in computer networks and systems including un-secure coding and unprotected networks								X
7	Team Working	How teams work effectively to produce technology solutions.	X				X			

8		The various roles, functions and activities related to technology solutions within an organisation.					X			
9	Project Management	How to deliver a technology solutions project accurately consistent with business needs.	X				X	X		X
10		The issues of quality, cost and time for projects, including contractual obligations and resource constraints.	X				X	X		
CORE SKILLS										
11	Information Systems	Is able to critically analyse a business domain in order to identify the role of information systems, highlight issues and identify opportunities for improvement through evaluating information systems in relation to their intended purpose and effectiveness.	X				X			X
12	System Development	Analyses business and technical requirements to select and specify appropriate technology solutions.	X				X			X
13		Designs, implements, tests, and debugs software to meet requirements using contemporary methods including agile development.		X	X					
14		Manages the development and assurance of software artefacts applying secure development practises to ensure system resilience.								X
15		Configures and deploys solutions to end users.		X	X				X	X

16	Data	Identifies organisational information requirements and can model data solutions using conceptual data modelling techniques.		X	X				X	
17		Is able to implement a database solution using an industry standard database management system (DBMS).		X						
18		Can perform database administration tasks and is cognisant of the key concepts of data quality and data security.		X						X
19		Is able to manage data effectively and undertake data analysis.			X				X	
20	Cyber Security	Is able to undertake a security risk assessment for a simple system and propose remediation advice.								X
21		Can identify, analyse and evaluate security threats and hazards to planned and installed information systems or services (e.g. Cloud services).								X
22	Business Organisation	Can apply organisational theory, change management, marketing, strategic practice, human resource management and IT service management to technology solutions development.	X				X			
23		Develops well-reasoned investment						X		
24	IT Project Management	Follows a systematic methodology for initiating, planning, executing, controlling, and closing projects.	X							

25		Applies industry standard processes, methods, techniques and tools to manage technology solutions projects.	X							
26		Is able to manage a project (typically less than six months, no inter-dependency with other projects and no strategic impact) including identifying and resolving deviations and the management of problems and escalation processes.		X	X				X	
27	Computer and Network Infrastructure:	Can plan, design and manage computer networks with an overall focus on the services and capabilities that network infrastructure solutions enable in an organisational context.								X
28		Identifies network security risks and their remediation.								X
	BEHAVIOURS									
29	Professional, interpersonal and business skills	1. Fluent in written communications, able to articulate complex issues.	X		X	X	X		X	X
30		2. Makes concise, engaging and well-structured verbal presentations, arguments and explanations.	X				X			
31		3. Able to deal with different, competing interests within and outside the organisation with excellent negotiation skills.	X				X			

32		4. Able to identify the preferences, motivations, strengths and limitations of other people and apply these insights to work more effectively with and to motivate others.	X				X		
33		5. Competent in active listening and in leading, influencing and persuading others constructively.	X				X		
34		6. Able to give and receive feedback constructively and incorporate it into their own development and life-long learning.							
35		7. Applies analytical and critical thinking skills to Technology Solutions development and to systematically analyse and apply structured problem solving techniques to complex systems and situations.							
36		8. Able to put forward, demonstrate value and gain commitment to a moderately complex technology-oriented solution, demonstrating understanding of business need, using open questions and summarising skills and basic negotiating skills.							
37		9. Able to conduct effective research, using literature and other media, into IT and business related topics.	X				X		
38	Attributes and behaviours	Have demonstrated that they have mastered basic business disciplines, ethics and courtesies, demonstrating timeliness and focus when faced with distractions and the ability to complete tasks to a deadline with high quality.							

39		Flexible attitude					X			
40		A thorough approach to work	X	X	X	X	X	X	X	X
41		Logical thinking and creative approach to problem solving		X	X			X	X	X
42		Ability to perform under pressure	X	X	X	X	X	X	X	X
	SPECIALIST KNOWLEDGE	- Network Engineer								
43		The fundamental building blocks (e.g. routers , switches, hubs, storage, transmission) and typical architectures (e.g. server/client, hub/spoke) of computers, networks and the Internet.				X				X
44		The main features of routing and Internet network protocols in use, their purpose and relationship to each other, including the physical and data link layer (e.g. https, HTTP, SMTP, SNMP, TCP, IP, etc.).				X				
45		The main factors that affect network performance (e.g. the relationship between bandwidth, number of users, nature of traffic, contention).								X
46		Failure modes in protocols (e.g. why a protocol may 'hang' and the effect of data communication errors).								
47		The ways to improve performance (e.g. application of traffic shaping, changes to architecture to avoid bottlenecks, network policy that prohibit streaming protocols).								

48		The issues that may arise in the day to day operation of networks and how to resolve them.								
	SPECIALIST SKILLS	- Network Engineer								
49		Plan, design, build and test a simple network to a requirement specification that includes hubs, switches, routers and wireless user devices, applying appropriate security products and processes.								X
50		Identify the key characteristics of a new network service and develop estimates of the expected traffic intensity and traffic load that the network must support.								
51		Determine the minimum network capacity of planned networks to meet network requirements.								
52		Design, build, test, configure and optimise a distributed network (more than 1 sub- net), including switches, routers and firewalls to meet given requirements.								X
53		Analyse network performance and troubleshoot typical problems in networks.								
54		Identify and evaluate network security risks and incorporate appropriate security products and processes into network designs to increase security, resilience and dependability.								X